Advanced Research Projects Agency • ENERGY

ELECTROFUELS PROJECT

UMASS AMHERST

BIOFUELS FROM SOLAR ENERGY AND BACTERIA

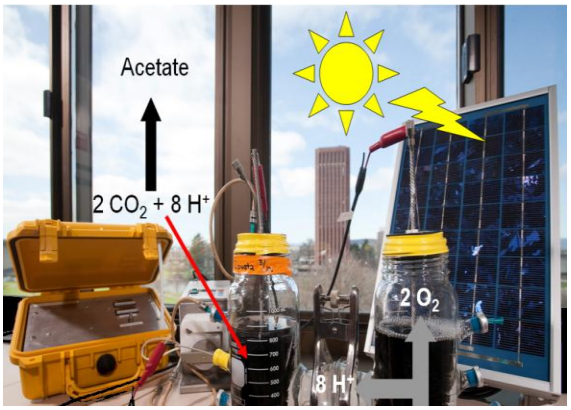
PROJECT TITLE:	Electrofuels Via Direct Electron Transfer from Electrodes to Microbes		
ORGANIZATION:	University of Massachusetts Amherst (UMass)	LOCATION:	Amherst, MA
PROGRAM:	Electrofuels	ARPA-E AWARD:	$5,968,000
TECH TOPIC:	Advanced Fuels	PROJECT TERM:	7/1/10 – 6/30/13
WEBSITE:	www.electrofuels.org		

CRITICAL NEED

Domestic biofuels are an attractive alternative to petroleum-based transportation fuels. Biofuels are produced from plant matter, such as sugars, oils, and biomass. This plant matter is created by photosynthesis, a process that converts solar energy into stored chemical energy in plants. However, photosynthesis is an inefficient way to transfer energy from the sun to a plant and then to biofuel. Electrofuels—which bypass photosynthesis by using self-reliant microorganisms that can directly use the energy from electricity and chemical compounds to produce liquid fuels—are an innovative step forward.

PROJECT INNOVATION + ADVANTAGES

UMass is feeding renewable electricity to bacteria to provide the microorganisms with the energy they need to turn carbon dioxide (CO_2) directly into liquid fuels. UMass' energy-to-fuels conversion process is anticipated to be more efficient than current biofuels approaches in part because this process will leverage the high efficiency of photovoltaics to convert solar energy into electricity. UMass is using bacteria already known to produce biofuel from electric current and CO_2 and working to increase the amount of electric current those microorganisms will accept and use for biofuels production. In collaboration with scientists at University of California, San Diego, the UMass team is also investigating the use of hydrogen sulfide as a source of energy to power biofuel production.



IMPACT

If successful, UMass would create a liquid transportation fuel that is cost competitive with traditional gasoline-based fuels and 10 times more efficient than existing biofuels.

- SECURITY: Cost-competitive Electrofuels would help reduce U.S. dependence on imported oil and increase the nation's energy security.
- ENVIRONMENT: Widespread use of Electrofuels would help limit greenhouse gas emissions and reduce demands for land, water, and fertilizer traditionally required to produce biofuels.
- ECONOMY: A domestic Electrofuels industry could contribute tens of billions of dollars to the nation's economy. Widespread use of Electrofuels could also help stabilize gasoline prices—saving drivers money at the pump.
- JOBS: Electrofuels could create jobs in fuel production, distribution, and sales.

CONTACTS

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